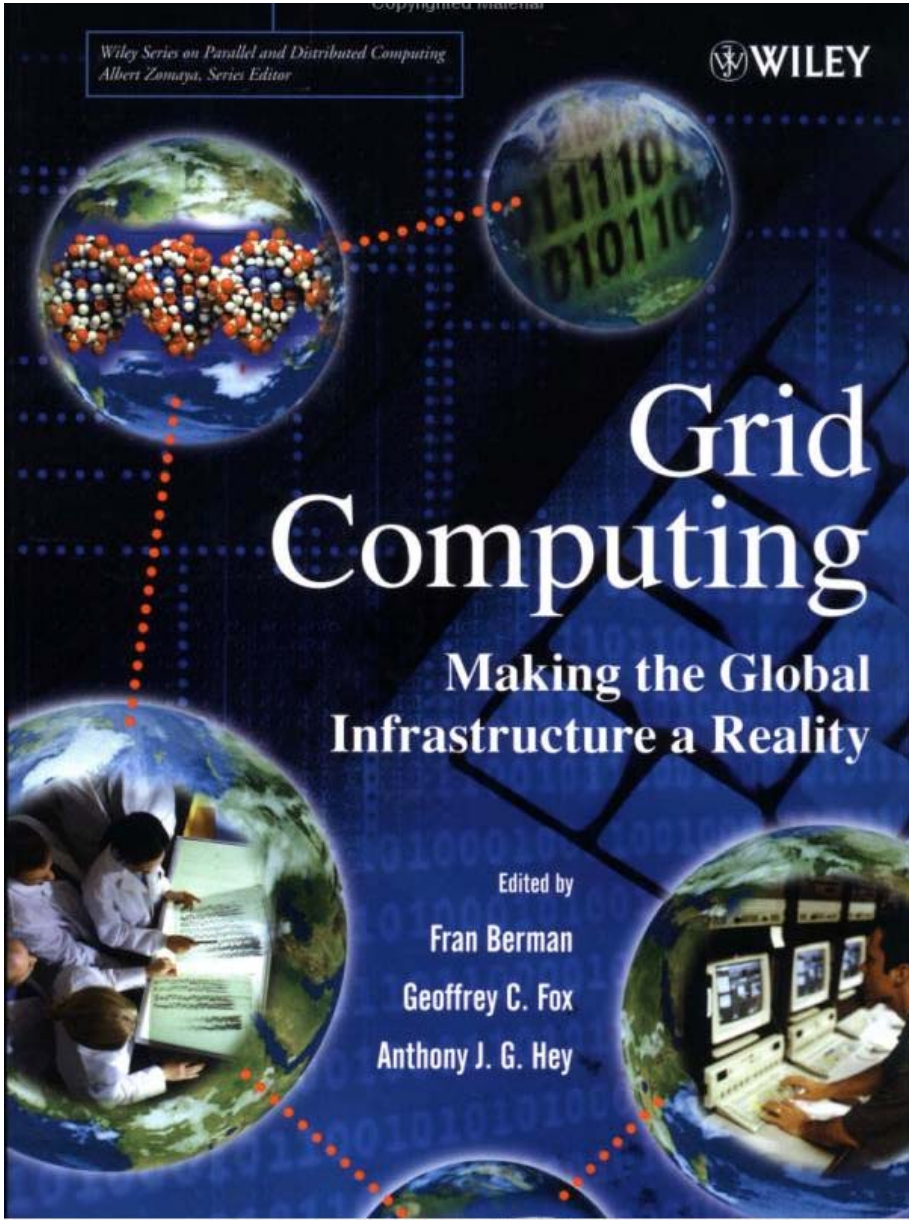
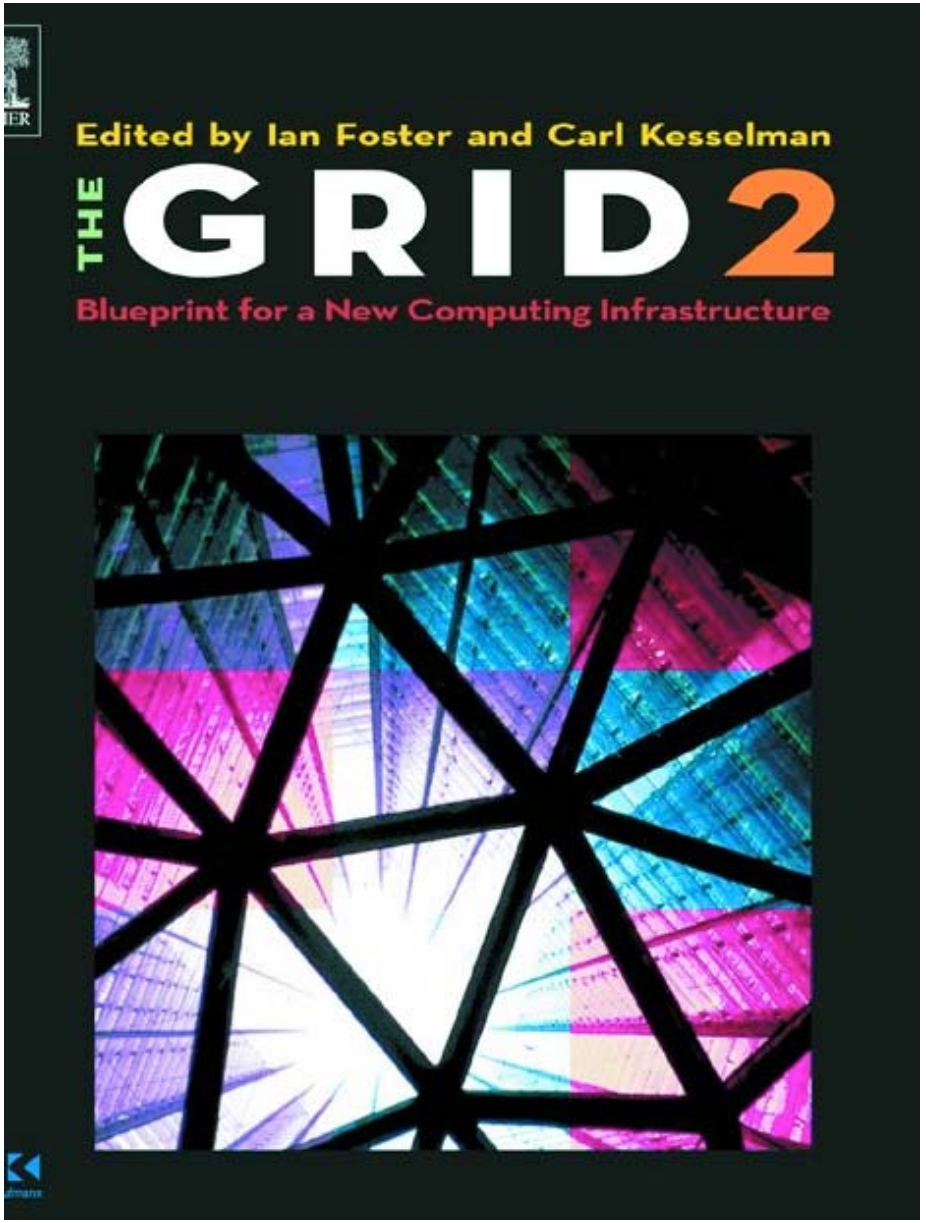
More Than You Could Want to Know





Vision: Create an e-Infrastructure

Opportunity: Convergence of e-Science and e-Business Middleware

Source: Luis Rodríguez-Roselló, EU

European Commission

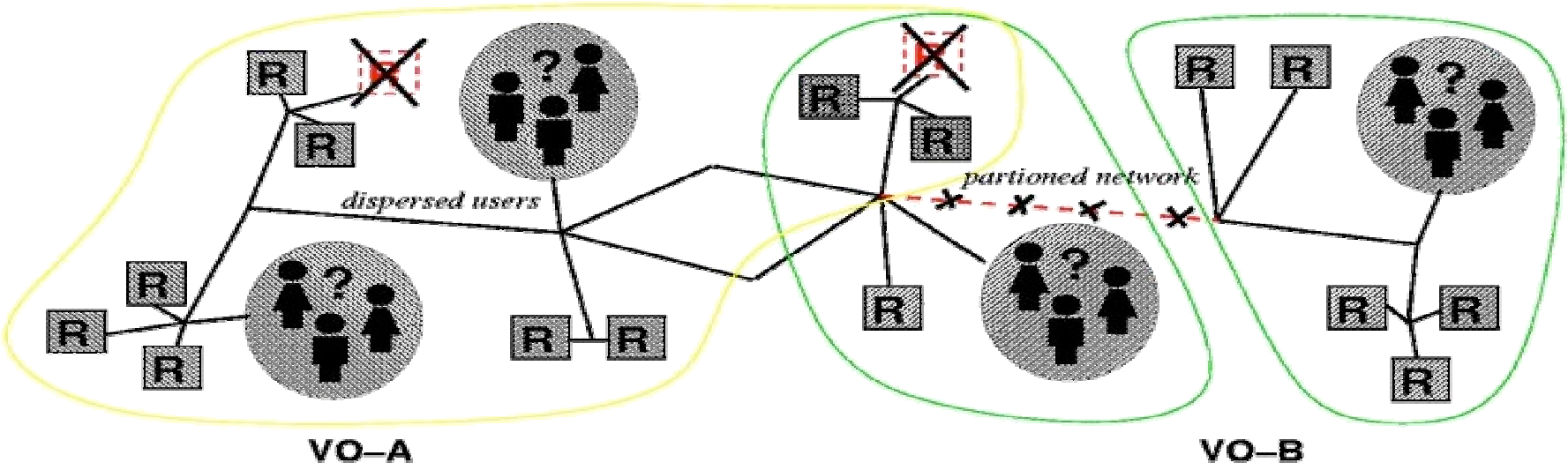
Information Society

the globus alliance
www.globus.org

The Grid

"Resource sharing & coordinated problem solving in dynamic, multi-institutional virtual organizations"

- Coordinates distributed resources ...
- using standard, open, general-purpose protocols and interfaces ...
- to deliver required qualities of experience



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Context

- Define a service-oriented architecture …
  - the key to effective virtualization
- … to address vital “Grid” requirements
  - AKA utility, on-demand, system management, collaborative computing
- … building on Web services standards
  - extending those standards where needed
  - enabling ubiquity and thus a rich ecology of platform and solution providers
- ➡ The “Open Grid Services Architecture”

Web Services

- Increasingly popular standards-based framework for accessing network applications
  - *Service oriented architecture:* everything is a service
  - Services built in *application server*
- XML based (eXtensible Markup Language) distributed computing framework
  - WSDL: Web Services Description Language
    - Interface Definition Language for Web services
  - SOAP: Simple Object Access Protocol
    - XML-based RPC protocol; common WSDL target
  - WS-Inspection
    - Conventions for locating service descriptions
  - UDDI: Universal Desc., Discovery, & Integration
    - Directory for Web services

The Grid Enables Transient Services

- "Web services" address discovery & invocation of persistent services
  - Interface to persistent state of entire enterprise
- In Grids, must also support transient services, created/destroyed dynamically
  - Interfaces to the states of distributed activities
  - E.g. workflow, video conf., dist. data analysis
- Significant implications for how services are managed, named, discovered, and used
  - In fact, much of our work is concerned with the management of services

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Open Grid Services Infrastructure (OGSI) to Web Services Reference Framework (WSRF)

- Globus Toolkit → OGSI → WSRF
- Announced at GlobusWORLD 2004 (Jan 20-23)
- The WSRF proposal is a re-factoring of OGSI concepts to align better with Web services
- Changes from OGSI to WSRF are primarily syntactic
- Grid adds to Web services in OGSI and WSRF:
  - The ability to create, address, inspect, discover, and manage stateful resources
  - In OGSI, these stateful resources are called Grid services
  - in WSRF, they are called WS-Resources

http://dsonline.computer.org/0402/d/o2004a.htm

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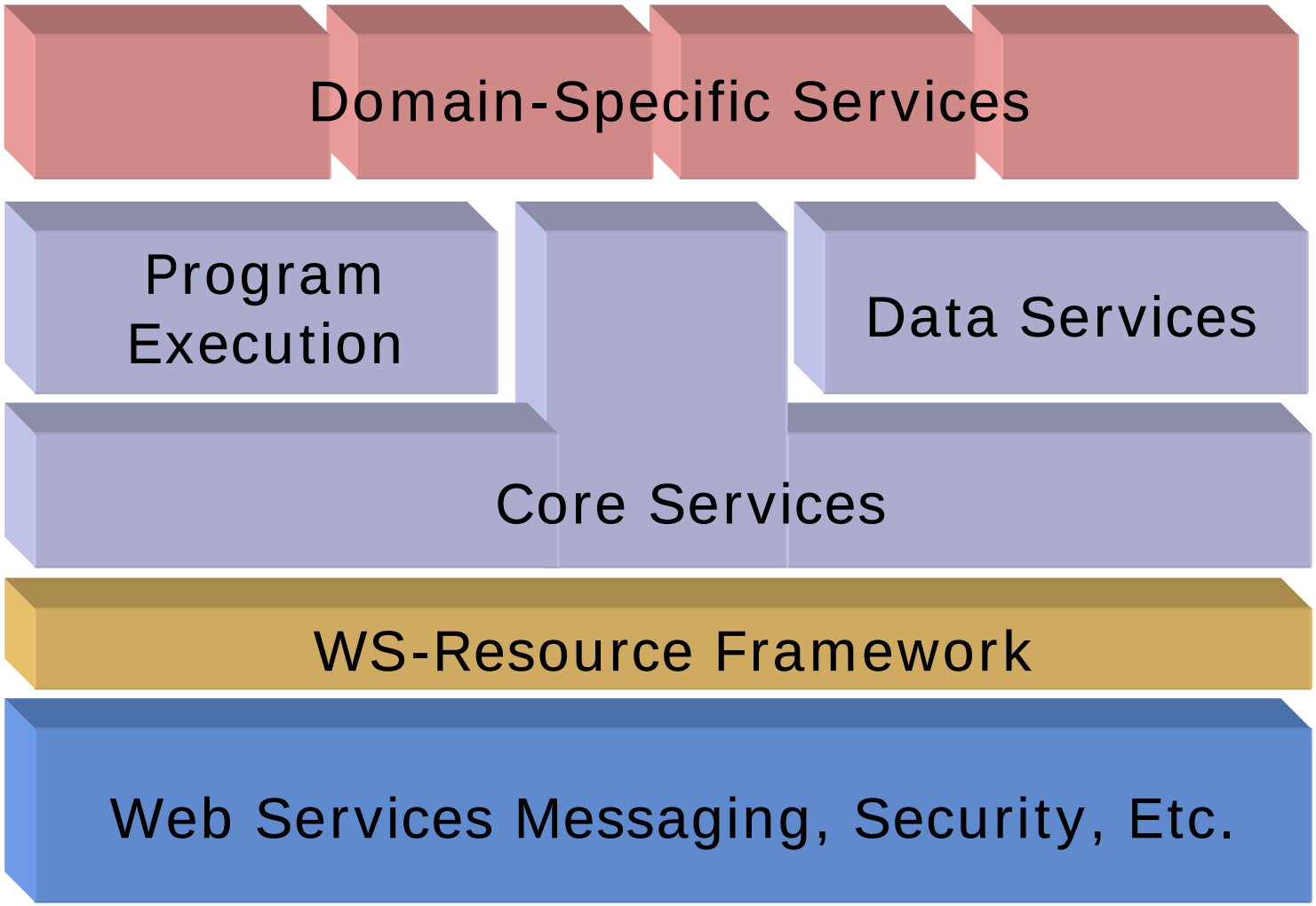
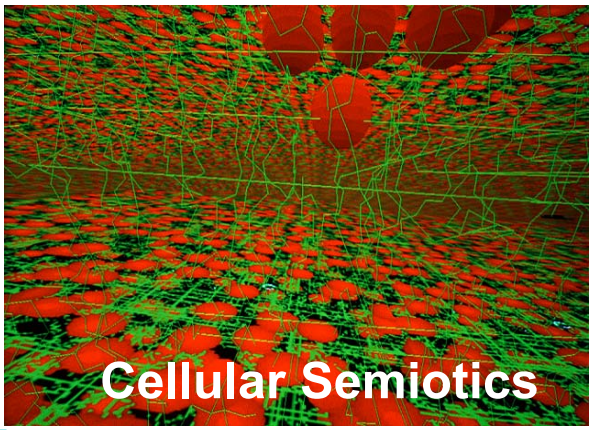
Grid-Web Services Convergence Completed: A Major Milestone!



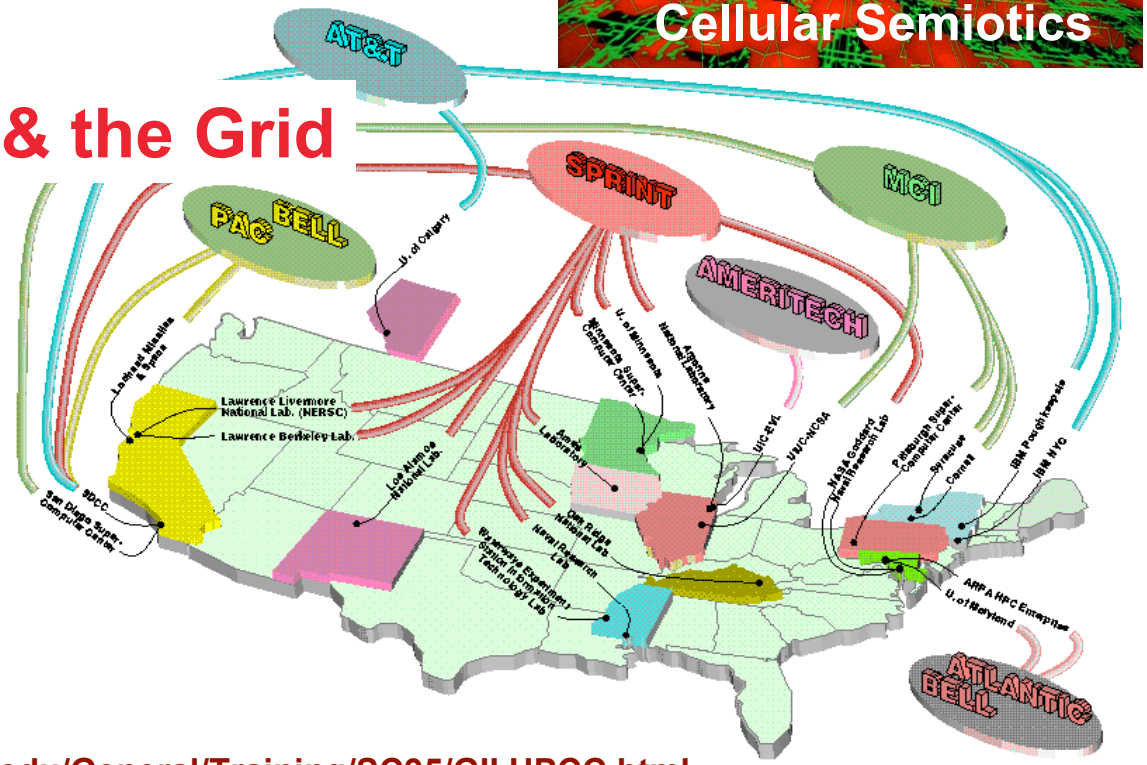
Supercomputing 95
I-WAY: Information Wide Area Year

I-Way Featured:

- Networked Visualization Application Demonstrations
- OC-3 (155Mbps) Backbone
- Large-Scale Immersive Displays
- I-Soft Programming Environment



Led Directly to Globus & the Grid



http://archive.ncsa.uiuc.edu/General/Training/SC95/GII.HPCC.html

UI mcs NCSA™

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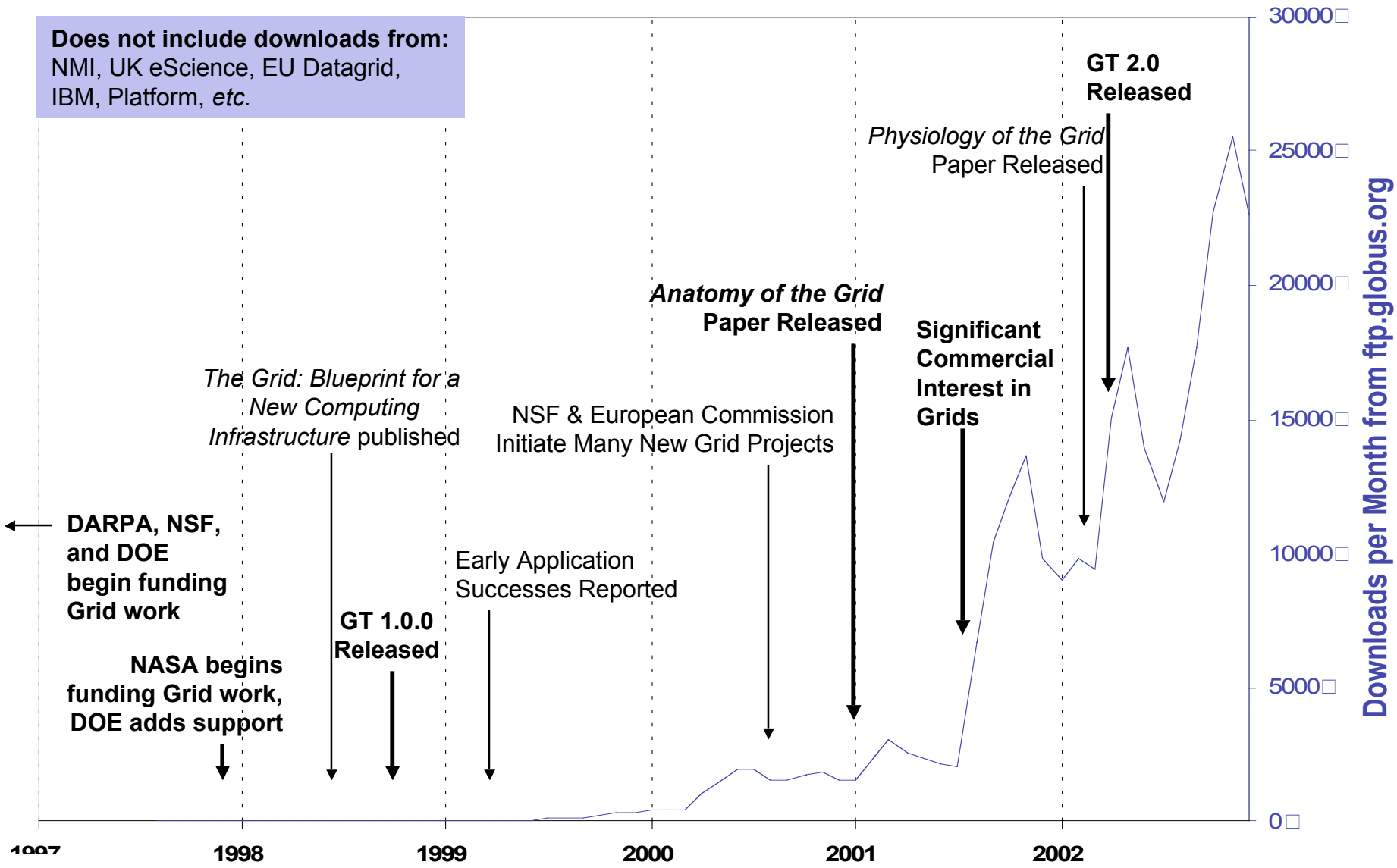
Globus Toolkit® History



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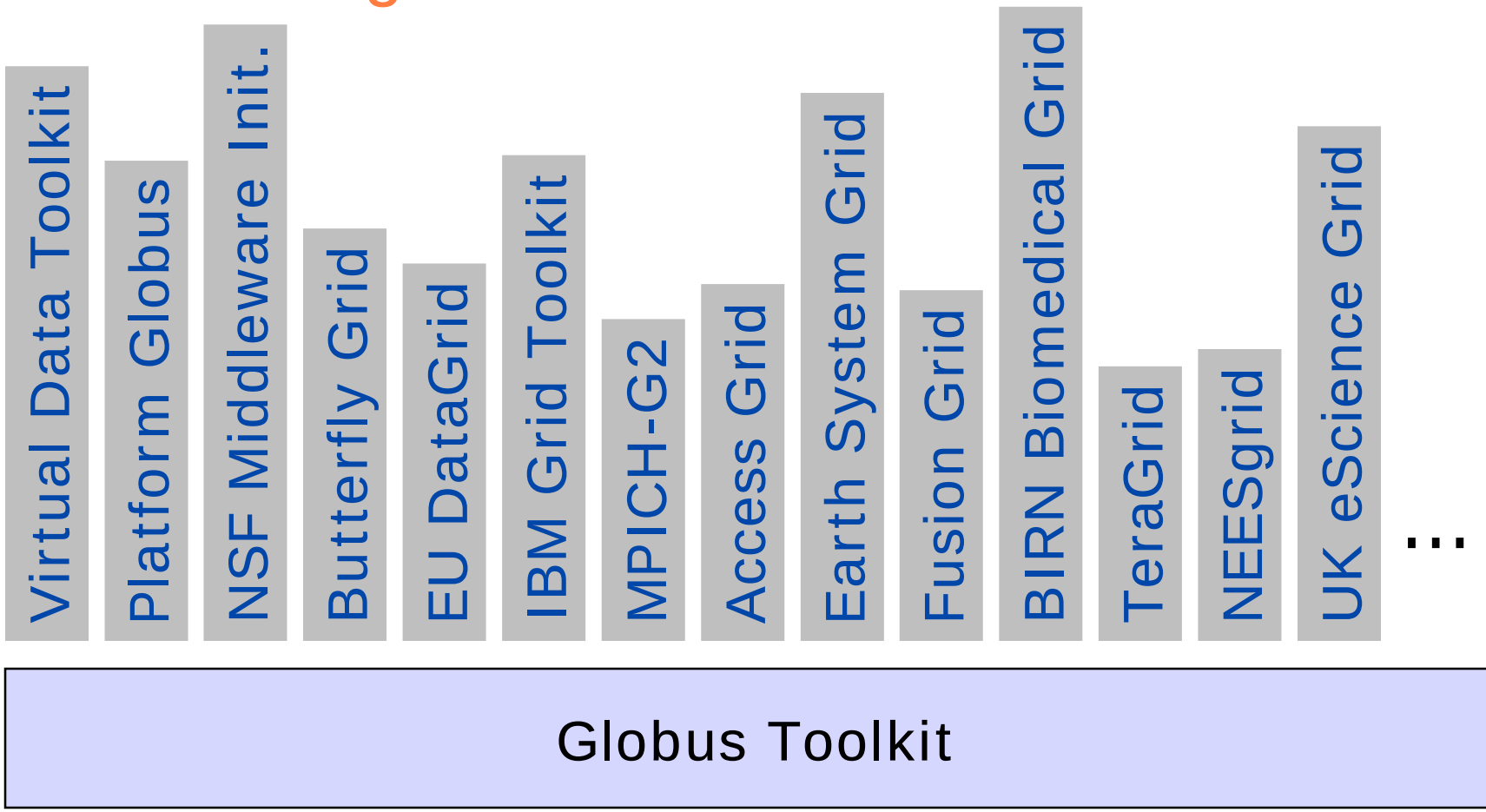
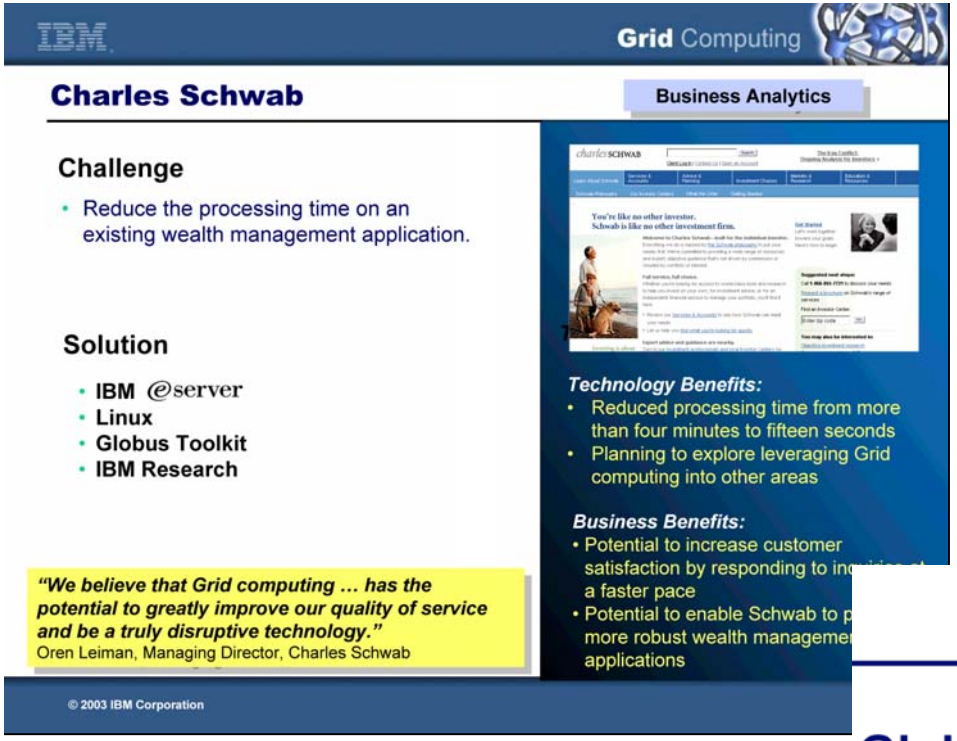
Partners are Creating Strong GT-Based Grid Solutions



Note that WSRF has little or no effect on solution users!

Industry Adopts Grid Technology



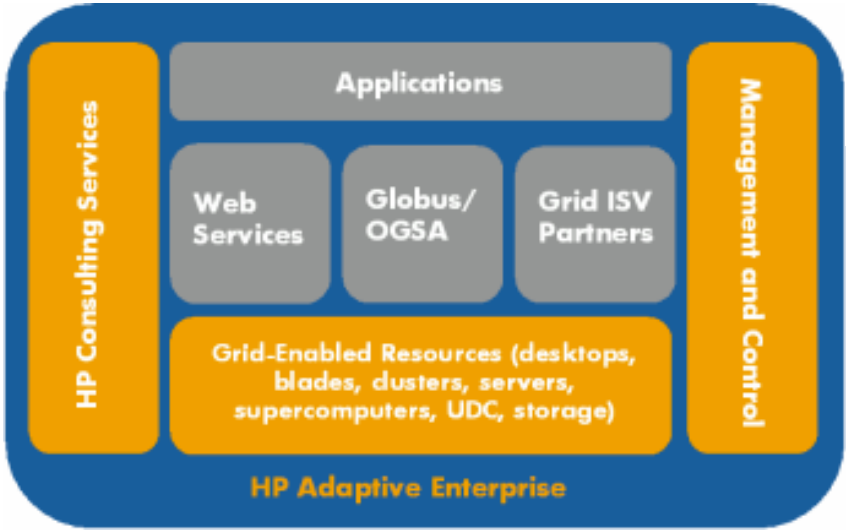
I.B.M. Making a Commitment to Next Phase of the Internet

The New York Times

By STEVE LOHR

I.B.M. is announcing today a new initiative to support and exploit a technology known as grid computing, which the company and much of the computer research community say is the

Merrill Lynch



Globus Grid Computing—the Next Internet

by John Roy/Steve Milunovich

The Internet was first a network and is now a communications platform. The next evolutionary step could be to a platform for distributed computing. This ability to manage applications and share data over the network is called "grid computing."


COVER STORY

ORACLE DATABASE 10g

THE WORLD'S FIRST

SELF-MANAGING, GRID-READY DATABASE ARRIVES

Oracle's new self-managing database increases performance and availability while enabling commercial grid computing.

There are trends. And there are trendsetters. In the early to mid-1990s, Oracle foretold the internet computing paradigm that organizations of every stripe have now woven into the fabric of their businesses. In the process, IT infrastructure has become extremely critical to the enterprise. "Businesses have become more dependent than ever on their IT systems for everything from day-to-day operations to providing service to their customers and clients," says Sushil Kumar, director of product management for Database Manageability at Oracle. "And many new-generation businesses, such as eBay and Amazon, rely completely on their IT infrastructure's being available—if the system goes away, their entire business is in jeopardy."

In short, says Kumar, IT systems have truly become strategic to the enterprise. And that has had a profound impact on the need for availability, scalability, and high performance of IT systems for organizations of all kinds. Downtime, even for much-needed maintenance, is not an option when a global business must run 24/7.

At the same time, says Kumar, there's growing pressure to maintain profitability amid ever-growing competition in a global economy that continues to tighten its belt. The result, is that "organizations must minimize operating expenses across the board—and IT is no exception," says Kumar.

But as IT systems have become more strategic and integral to the core business, they have also become more complex, more difficult to manage, and more costly. Complexity adds to costs across the board, in terms of time, labor, potential failures, and inability to recover from failure effectively. According to Kumar, these are all reasons why "one of the biggest challenges facing most organizations today is managing a strategic part of the business, its IT systems, more effectively than ever—ensuring the highest performance, scalability, and availability—but at a significantly lower cost than before." There are also some of the reasons that commercial grid computing, enabled in part by cost-effective blade servers, is getting so much attention today. For small incremental costs, organizations can gain more processing power to be used by all data center resources, delivering faster performance and high availability and scaling as needed—but only if the software can effectively take advantage of that architecture.

Clearly, the time is right for software that monitors and manages itself: software that eases management complexity in a cost-effective manner.

BY KELLI WISETH

The GEON Project

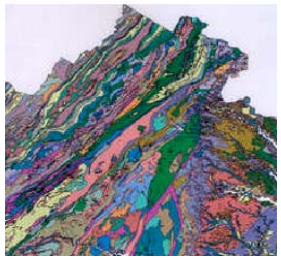
- Close collaboration between geoscientists and IT to interlink databases and Grid-enable applications
- "Deep" data modeling of 4D data
  - Situating 4D data in context—spatial, temporal, topic, process
  - Semantic integration of Geosciences data
    - Logic-based formalisms to represent knowledge and map between ontologies
- Grid computing
  - Workflow-based specification of computational tasks
  - Deploying a prototype GEON Grid: heterogeneous networks, PoP nodes, Data clusters, and compute clusters
- Interaction environments
  - Information visualization. Visualization of concept maps
  - Remote data visualization via high-speed networks
  - Augmented reality in the field

A Geoscientist's Information Integration Scenario

What is the distribution and U/ Pb zircon ages of A-type plutons in VA?
How about their 3-D geometry using gravity data ?
How do the plutons relate to the host rock structures?

?

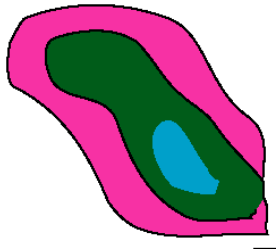
Information Integration



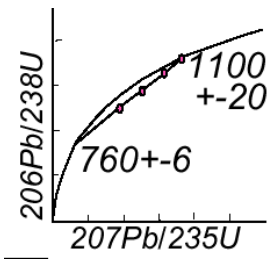
Digital geologic map Of Virginia (plutons in Virginia)

SiO2 72.22
CaO 0.62
K2O 4.88
Ga 21.1
Sr 72.6

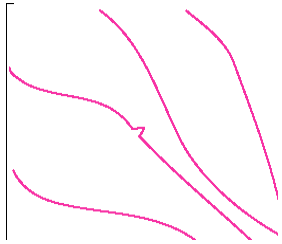
Geochemical Database (chemical data)



Geophysical Database (gravity contours)



Geochronologic database (Concordia)



Structure database (foliation map)

Virginia Tech & GEON

GEON

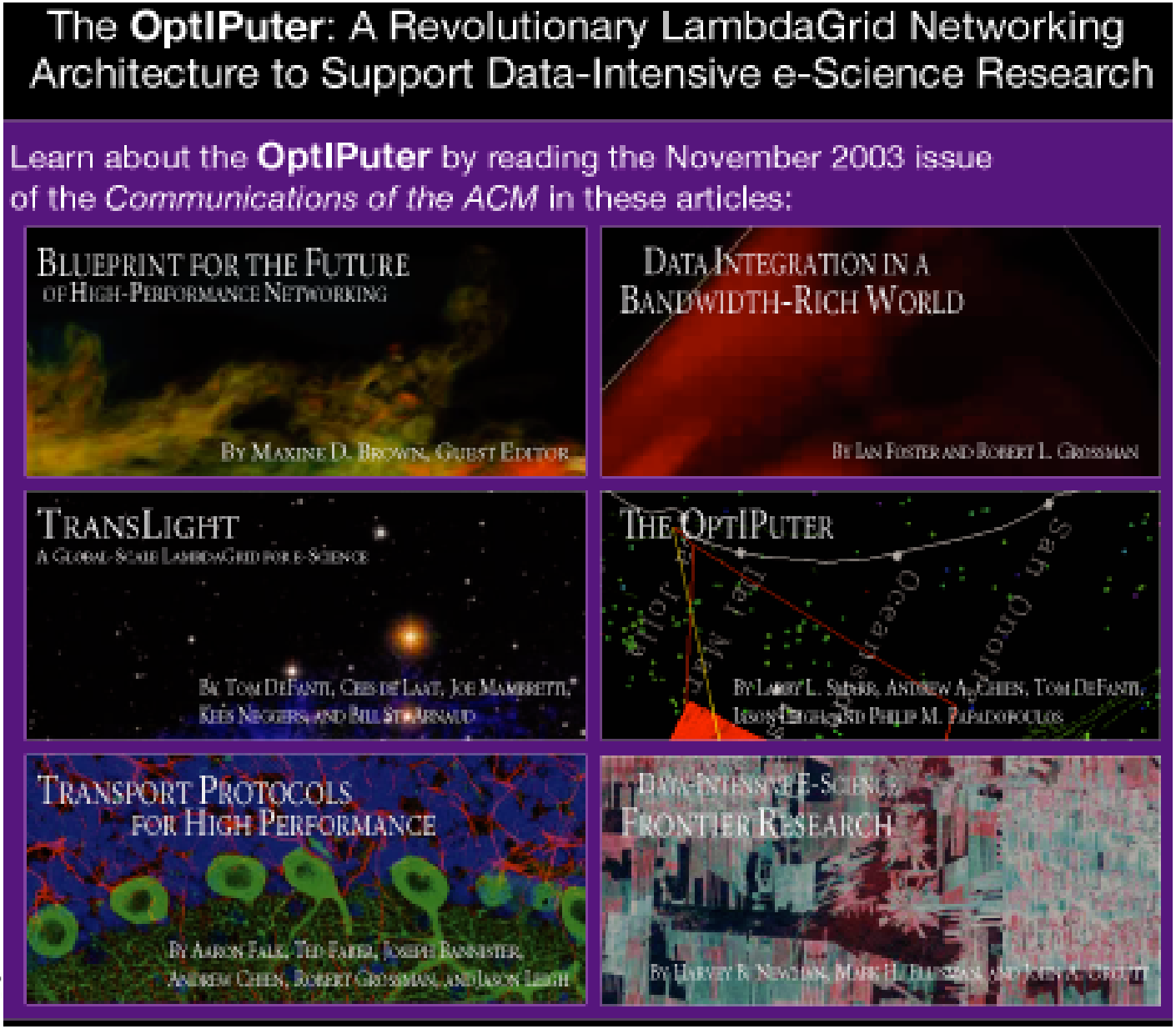
Source: Chaitan Baru, SDSC

CYBERINFRASTRUCTURE FOR THE GEOSCIENCES

Web Services and GEON

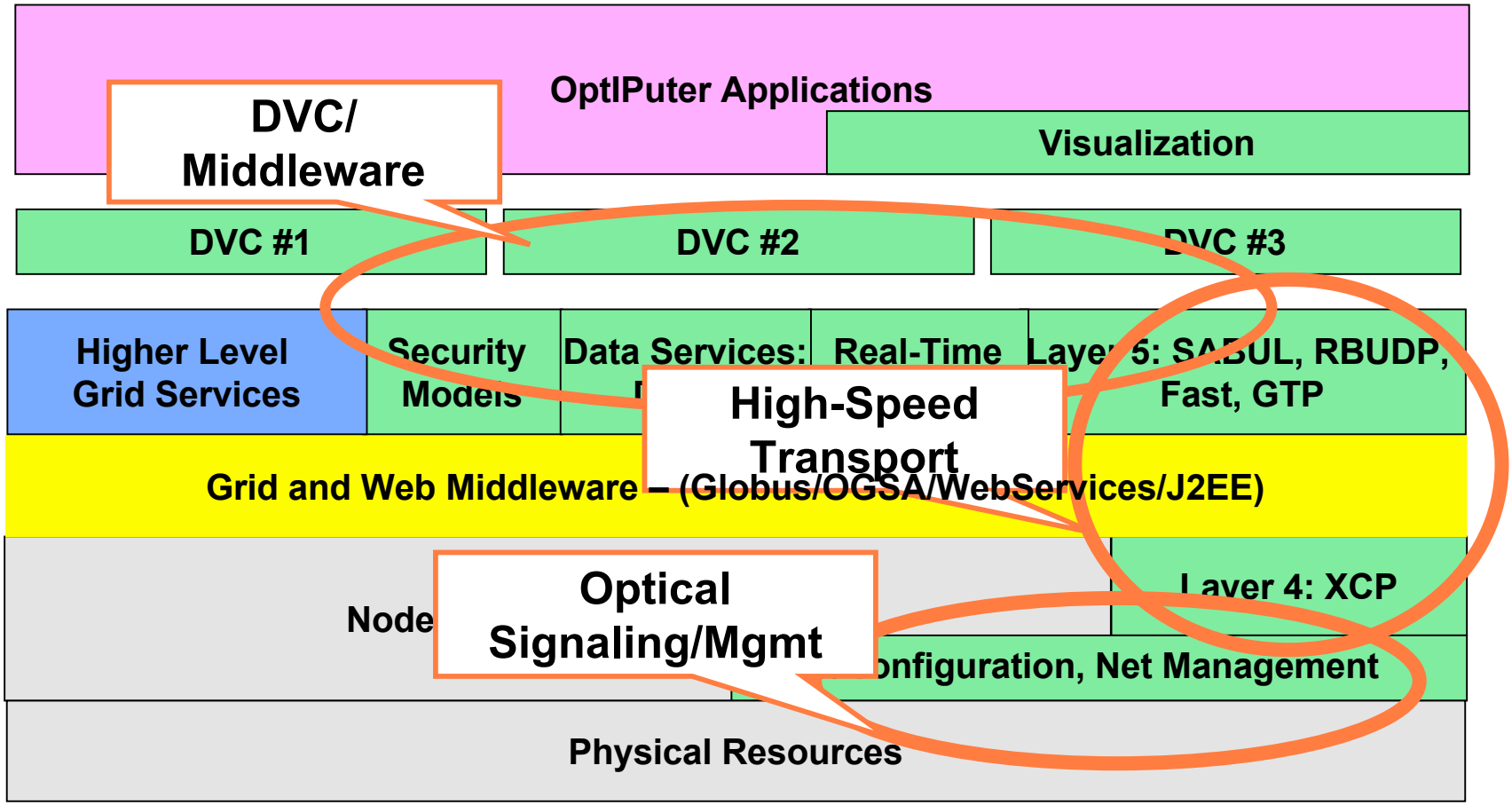
- GEON software stack is based on OGSI / Globus Toolkit3
- Each node in the system runs same software stack
  - Installed via Rocks, and GEON Rolls (a set of GEON-specific RPM's)
- Approach to Web services
  - GEON services are Web services with GSI authentication
  - Will move to WSRF framework when it is mature
  - Implementing a distributed Web services catalog across GEON
- Web services management
  - SDSC currently works with Cal-$(IT)^2$ partner, Blue Titan (BT)
  - BT Network Director provides WS management for services published at webservices.sdsc.edu.
  - Similar capability being investigated for GEON.
  - Provides for failover and QoS capabilities

See Nov 2003 CACM
For Articles on OptIPuter Technologies



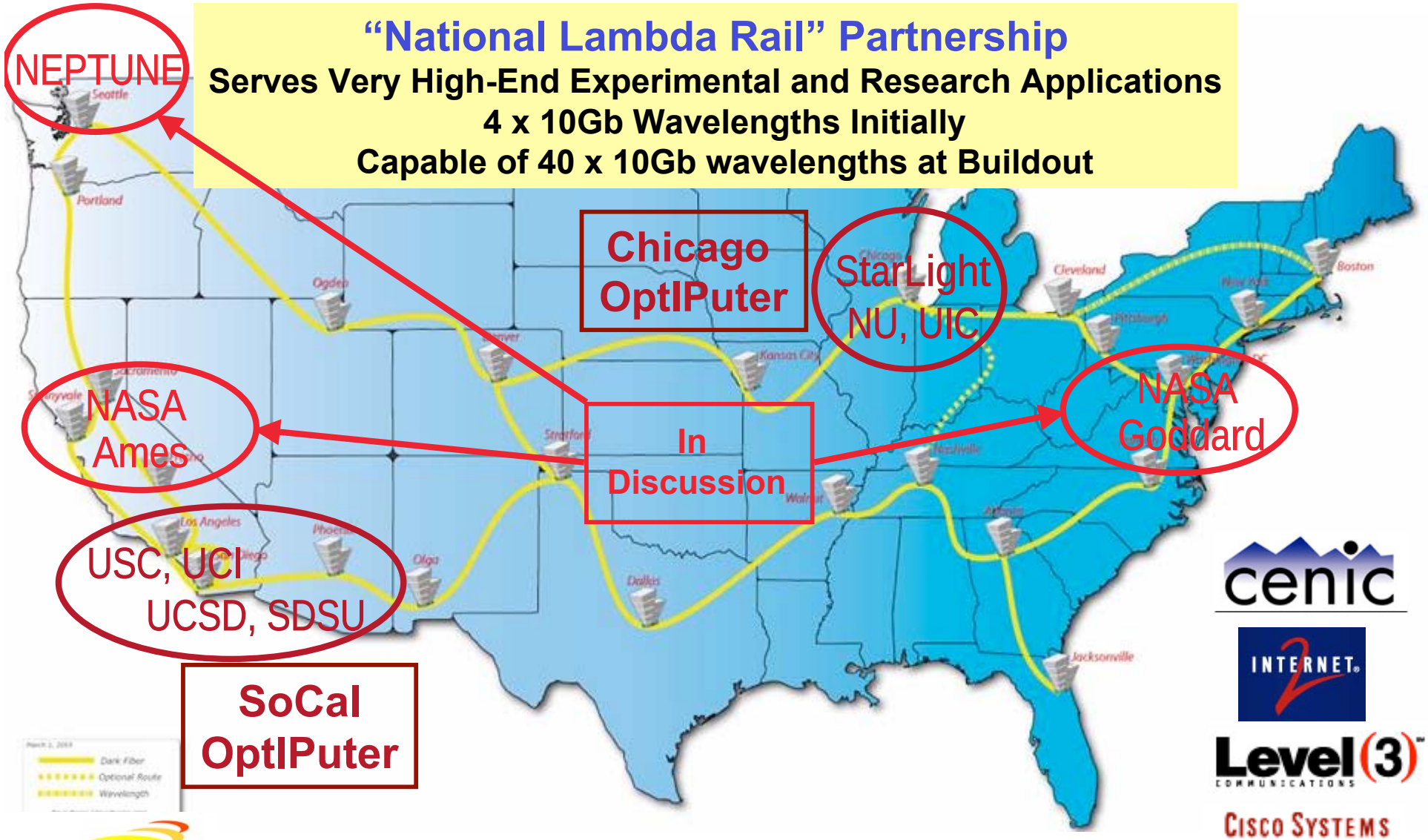
OptIPuter

OptIPuter Software Architecture for Distributed Virtual Computers v1.1



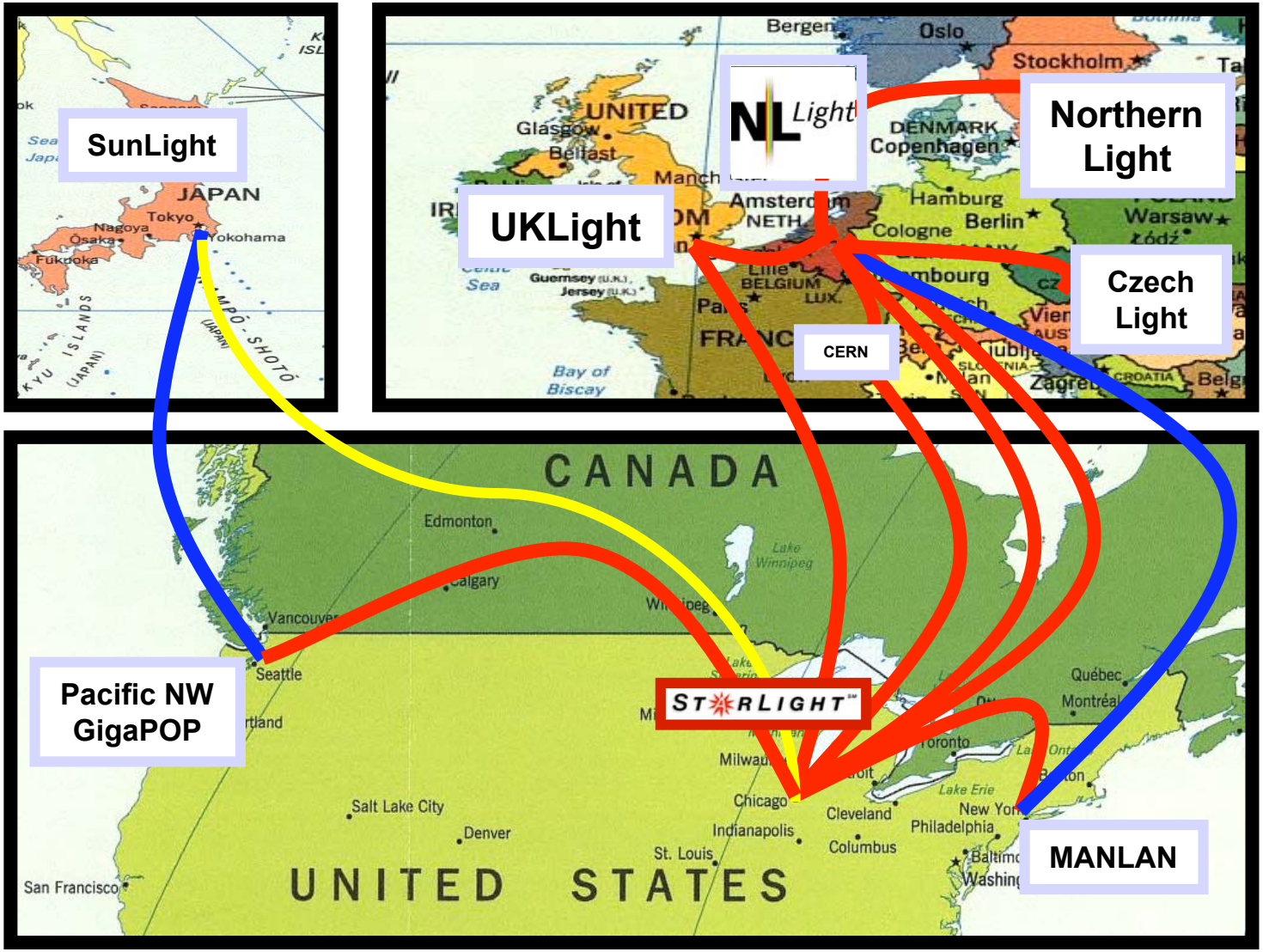
Source: Andrew Chien, UCSD
OptIPuter Software Systems Architect

The OptIPuter Will Become a National-Scale Collaboratory in 2004



Source: Tom West, CEO, NLR

An International-Scale OptIPuter is Operational over the First Set of 76 International GE TransLight Lambdas



European lambdas to US
–8 GEs Amsterdam—Chicago
–8 GEs London—Chicago
Canadian lambdas to US
–8 GEs Chicago—Canada —NYC
–8 GEs Chicago—Canada —Seattle
US lambdas to Europe
–4 GEs Chicago—Amsterdam
–3 GEs Chicago—CERN
European lambdas
–8 GEs Amsterdam—CERN
–2 GEs Prague—Amsterdam
–2 GEs Stockholm—Amsterdam
–8 GEs London—Amsterdam
TransPAC lambda
–1 GE Chicago—Tokyo
IEEAF lambdas (blue)
–8 GEs NYC—Amsterdam
–8 GEs Seattle—Tokyo

OptIPuter

SIO's High Resolution OptIPuter Visualization Systems

Earth Sciences are an OptIPuter Driver